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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/484,799	01/18/2000	Jeremy Barker	VT-1869	1118

33204 7590' 06/24/2003  
VALENCE TECHNOLOGY, INC.  
301 CONESTOGA WAY  
HENDERSON, NV 89015

EXAMINER

CHANEY, CAROL DIANE

ART UNIT	PAPER NUMBER
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1745

26

DATE MAILED: 06/24/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.	Applicant(s)	
09/484,799	BARKER ET AL.	
Examiner	Art Unit	
Carol Chaney	1745	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on 04 April 2003.
- 2a) ☐ This action is FINAL.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 135-176 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 135-161, 165-172 and 176 is/are rejected.
- 7) ☐ Claim(s) 162-164 and 173-175 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All   b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

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***Claim Rejections - 35 USC § 102***

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claims 135-152 are rejected under 35 U.S.C. 102(b) as being anticipated by Ni et al., "Triphylite-lithiophilite series in China", Yanshi Kuangwuxue Zazhi (1989), 8(2), 144-55.

Ni et al. disclose chemical compositions of the triphylite ( $\text{LiFePO}_4$ )-lithiophilite ( $\text{LiMnPO}_4$ ) series of compositions found in China. They show that besides the major constituents  $\text{Fe}^{+2}$  and  $\text{Mn}^{+2}$ , the cations  $\text{Mg}^{+2}$ ,  $\text{Ca}^{+2}$ , and  $\text{Fe}^{+3}$  may be present at the octahedral M(2) sites. (Note second paragraph of English language abstract.) Thus, compounds of the form  $\text{LiFe}_{1-y}\text{M}_y\text{PO}_4$  where M is Mg or Ca are disclosed.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

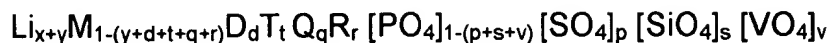
(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 135-147, 152-161, 165-172, and 176 are rejected under 35 U.S.C. 103(a) as being unpatentable over Armand et al., US Patent 6,514,640.

Armand et al. disclose lithium ion battery cathode materials based on the general formula  $\text{LiMPO}_4$  having olivine structures. "Modified olivine structures" are also included

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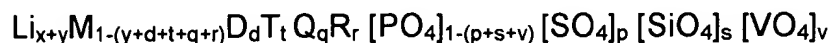
in the Armand et al. disclosure. The modified olivine structures have the general formula:



where M may be  $\text{Fe}^{2+}$  or  $\text{Mn}^{2+}$  or mixtures thereof; D may be a metal in the +2 oxidation state, preferably  $\text{Mg}^{2+}$ ,  $\text{Ni}^{2+}$ ,  $\text{Co}^{2+}$ ,  $\text{Zn}^{2+}$ ,  $\text{Cu}^{2+}$ , or  $\text{Ti}^{2+}$ ; T may be a metal in the +3 oxidation state; Q may be a metal in the +4 oxidation state; R may be a metal in the +5 oxidation state. x, y, d, t, q, r, p, s, and v may be between 0 (zero) and 1 (one), with at least one of y, d, t, q, r, p, s, or v differing from 0. In a preferred embodiment y, d, t, q, r, and v may vary between 0 (zero) and 0.2 (2/10). (Column 2, line 63 – column 3, line 40.)

The negative electrode of the battery may be lithium-carbon intercalation compounds or lithium-titanium spinels. (Column 3, lines 51-64.)

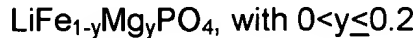
The disclosure of Armand et al. differs from applicants' claims in that Armand et al. do not explicitly recite the compound  $\text{LiFe}_{1-y}\text{Mg}_y\text{PO}_4$  as a cathode material. However, applicants' invention as a whole would have been obvious to one of ordinary skill in the art based upon the Armand et al. reference. Armand et al. disclose a class of cathode materials given by the general formula:



It is noted that in this formula, only one of y, d, t, q, r, p, s, or v must differ from 0. Thus, the Armand et al. disclosure encompasses single ion substitutions of 'M'. Because  $\text{Mg}^{2+}$  is listed as a preferred metal 'D', the olivine structure is preferably modified by aliovalent

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or isocharge substitutions (column 2, lines 51-52), and  $\text{Mg}^{2+}$  is given as a specific example of a cation isocharge with  $\text{Fe}^{2+}$  (column 2, lines 42-57), a lithium ion battery with a cathode active material of the formula



would have been obvious to one of ordinary skill in the art based upon the Armand et al. disclosure.

### ***Allowable Subject Matter***

Claims 162-164 and 173-175 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The nearest prior art of record, of Armand et al., fails to suggest cathode active materials and batteries having the formula  $\text{LiFe}_{1-y}\text{Ca}_y\text{PO}_4$  with  $0 < y \leq 0.2$

### ***Response to Arguments***

Applicant's arguments filed 4 April 2003 have been fully considered but they are not persuasive. Applicants assert the claimed  $\text{LiFe}_{1-y}\text{Mg}_y\text{PO}_4$  is not obvious in view of the teachings of Armand et al. In response, it is noted that Armand et al. state:

Thus, the invention additionally provides cathode materials where the pristine olivine structure of  $\text{LiM}(\text{PO}_4)$  ( $\text{M}=\text{Fe}$  or  $\text{Mn}$  or their solid solutions)

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is modified either on the anionic site or on the cationic site or on both, by aliovalent or isocharge substitutions... (column 14, lines 3 to 7.)

Thus, Armand et al. envision cathode materials of the form  $\text{LiFePO}_4$  modified on the cation site by an isocharge substitution, and  $\text{Mg}^{+2}$  is specifically mentioned as an isocharge substituent for  $\text{Fe}^{+2}$ . (Column 2, lines 56-58.)

Applicants assert the compound  $\text{LiFe}_{1-y}\text{Mg}_y\text{PO}_4$  is not part of the Armand et al. invention because its stoichiometry does not meet the last condition for site occupancy and electroneutrality mentioned by Armand et al. (Note column 3, lines 27-40.) However, it is the position of the examiner that the condition mentioned by Armand et al, is incorrect. Armand provides the equation:

$$(1) \quad 3 + s - p = x - y + t + 2q + 3r$$

This equation is essentially indicating that the anionic charges, including substitutions, must be equal to the cationic charges, including substitutions. Obviously, the equation should be valid when reduced to the simplest, unsubstituted formula,  $\text{LiMPO}_4$  (where M is  $\text{Fe}^{+2}$  or  $\text{Mn}^{+2}$ ). In this case,  $s = p = y = t = q = r = 0$  and  $x = 1$ . Substitution into equation (1) results in

$$(2) \quad 3 = 1.$$

It would appear that the electronic charge on the 'M' cation has be inadvertently omitted from equation (1).

Taken as a whole, Armand teaches cathode materials for lithium ion batteries which are based upon the "olivine" compounds,  $\text{LiMPO}_4$  and teaches that either the

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anion sites, the cation sites, or both anion and cation sites may be substituted. Specific examples of substituents are taught by Armand et al., among which is  $Mg^{+2}$  (See Armand, column 12, lines 13-23.)  $Mg^{+2}$  is specifically mentioned as an isocharge substituent for  $Fe^{+2}$ . (See column 2, lines 56-57.) Thus, based upon the disclosure of Armand et al. cathodes for lithium batteries having  $LiFe_{1-y}Mg_yPO_4$  as an active material would have been obvious to one of ordinary skill in the art.

### **Conclusion**

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Carol Chaney whose telephone number is (703) 305-3777. The examiner can normally be reached on Mon - Fri 8:00am-4:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on 703-308-2383. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.



Carol Chaney  
Primary Examiner  
Art Unit 1745

cc  
June 15, 2003